

# PATENT ABSTRACTS OF JAPAN

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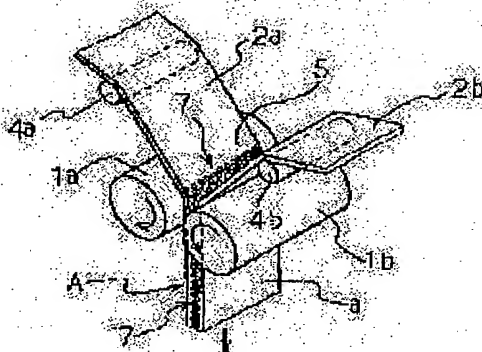
## (54) PRODUCTION OF COMPOSITE

### (57)Abstract:

**PURPOSE:** To provide the production method capable of uniformly containing a specified amount of metal powder in the material main body, which joins two tapes consisting of a specified metal material by rolling roll.

**CONSTITUTION:** Two tapes 2a, 2b are inserted into left/right two rolling rolls 1a, 1b arranged side by side, both tapes are mutually joined to produce a tape like material main body. A powder pool part 5 is formed between both tapes 2a, 2b by stretching to the prescribed angle at before joining point for both metal tapes 2a, 2b. A powder 7 consisted of the higher melting point metal than that of the

metal tapes 2a 2b is supplied to the powder pool part 5, filling the powder 7 into the material main body (a) by rolling-in force of the rolling rolls 1a, 1b.



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3. In the drawings, any words are not translated.

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**CLAIMS**

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**[Claim(s)]**

[Claim 1] While inserting in the metal tape of two sheets from the upper part between the reduction rolls of the Yuji Hidari book installed horizontally, making these both tapes join mutually and producing a tape-like ingredient body Make a predetermined include angle extend the junction this side part in said both metal tape, and between both metal tapes, collect in the end of powder and the section is formed. The manufacture approach of the composite material characterized by supplying the powder which collects in this end of powder and becomes the section from a desired ingredient, and making it filled up with said powder in the above-mentioned ingredient body according to the entrainment force of a reduction roll.

[Claim 2] The manufacture approach of a composite material according to claim 1 characterized by adjusting the extension include angle of the junction this side part in both the above-mentioned metal tape, and controlling powdered content.

[Claim 3] The manufacture approach of a composite material according to claim 1 or 2 characterized by collecting in the above-mentioned end of powder, falling in the end of powder and covering the crosswise both-sides part of the metal tape in the section by the wall for prevention.

[Claim 4] The manufacture approach of a composite material according to claim 1 to 3 characterized by the metal tape of the two above-mentioned sheets consisting of homogeneous solder material.

[Claim 5] The manufacture approach of a composite material according to claim 1 to 3 characterized by consisting of a heterogeneous ingredient chosen from the metals with which the metal tape of the two above-mentioned sheets serves as a raw material of solder material and solder material.

[Claim 6] The manufacture approach of a composite material according to claim 1 to 5

characterized by making the above-mentioned ingredient body insert in between the second two reduction rolls, and making the outside of an ingredient body join a metal tape with the second reduction roll.

## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention relates to the manufacture approach of the connection ingredient used for connection of the electronic parts in a power transistor etc., and the composite material used for immobilization in the substrate of a semiconductor chip etc. in more detail.

#### [0002]

[Description of the Prior Art] The composite material which made high-melting powder mix in the shape of dispersion rather than solder into the solder body produced in the shape of a tape as a connection ingredient used from the former in case a semiconductor chip is fixed on a substrate is known.

[0003] When this composite material heats and carries out melting of the optimum dose in the condition of having carried on the substrate, it holds the thickness (height) of melting solder uniformly by each particle of said powder, and makes the semiconductor chip set on this solder fix horizontally on a substrate. Thus, it is useful to connect a semiconductor chip horizontally on a substrate at the point which heat-resistant predetermined cycle nature is held in that connection part, and prevents the exfoliation of a semiconductor chip and defective continuity by the temperature change.

[0004] Moreover, as what raises the usefulness of an above-mentioned composite material more, these people invented the composite material which it makes it come to fill up powder into the cross-section central part of a tape-like solder body, and applied to it previously (Japanese Patent Application No. No. 285968 [ four to ]).

#### [0005]

[Problem(s) to be Solved by the Invention] When manufacturing the composite material of the point application by these people who can describe a top, as the former is shown in drawing 10 Reduction roll 101,102 of the two upper and lower sides arranged in perpendicularly Solder tape 201,202 of the two upper and lower sides arranged possible [ migration to a horizontal direction ] in between From the side, it inserts in and they are these both tapes 201,202. You make it roll out and join and it is

the solder body 300. While producing Solder tape 202 of the bottom before junction \*\*\*\*\* or a feeder is used for a top face (namely, plane of composition with the upper solder tape 201), and it is powder 400. The approach of sprinkling was adopted.

[0006] However, it sets to \*\* et al. and such a conventional manufacture approach, and is the solder tape 202. It is powder 400 upwards. About [ that it is difficult to distribute homogeneity ] and solder tape 202 Powder 400 supplied by the vibration accompanying migration It falls and is the solder body 300. It had left the room of amelioration to the point of making homogeneity containing the powder 400 of a constant rate in inside.

[0007] As a means to solve the above-mentioned fault, it is powder 400. You make it mix into liquids, such as alcohol, and it is the solder tape 202 about the liquid. Although applying upwards is also considered In this case, before a liquid dries, they are both the tapes 201,202. When it rolls out, that liquid becomes obstructive and it is a tape 201,202. It is powder 400 like [ after mutual junction becomes uncertainty and a liquid dries ] the above-mentioned means. The falling fault arises.

[0008] This invention is made in view of a situation such conventionally, and the place made into the purpose is to offer the manufacture approach with possible making homogeneity contain the metal powder of a constant rate in the ingredient body which joins and fabricates two tapes which consist of predetermined metal material with a reduction roll.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the manufacture approach of the composite material concerning this invention While inserting in the metal tape of two sheets from the upper part between the reduction rolls of the Yuji Hidari book installed horizontally, making these both tapes join mutually and producing an ingredient body It is characterized by supplying the powder which a predetermined include angle is made to extend the junction this side part in said both metal tape, and collects between both metal tapes in the end of powder, forms the section, collects in this end of powder, and becomes the section from a desired ingredient, and making it filled up with said powder in the above-mentioned ingredient body according to the entrainment force of a reduction roll.

[0010] Moreover, it is more effective to control powdered content by adjusting the extension include angle of both the above-mentioned metal tape from the below-mentioned reason, to collect in the above-mentioned end of powder, to fall in the end of powder and to cover the crosswise both-sides part of the metal tape in the section by the wall for prevention, etc.

[0011] It is possible to fabricate the metal tape of the two above-mentioned sheets from the heterogeneous ingredient chosen from the metals used as the raw material of fabricating by homogeneous solder material or solder material, and solder material. As solder material, Pb, Sn, Ag, In, Au, etc. are mentioned, respectively as a metal with which for example, PbSn system solder, PbAgSn system solder, Pb system solder, Sn system solder, In system solder, Au system solder, etc. serve as a raw material of solder material.

[0012] Moreover, it is useful to make the above-mentioned ingredient body insert in between the second two reduction rolls, and to make the outside of an ingredient body join a metal tape with the second reduction roll.

[0013]

[Function] According to the above-mentioned means, the junction this side part in both the metal tape, i.e., right above [ of-two right and left / reduction roll ], is covered in the end of powder it is extended at a predetermined include angle, and the section is formed. It collects in the end of powder, and has supply \*\*\*\* for powder in the section. Between the metal tapes before this powder joining Constant-rate \*\*\*\*\*, It enters between both metal tapes with migration of the gravity which requires this powder perpendicularly, and each metal tape, and the composite material which contained the powder of a constant rate in homogeneity in the ingredient body is obtained by both the metal tape being rolled out and joined to coincidence.

[0014] Powder content becomes low, as a result of the contamination force of the powder by the reduction roll becoming small and the amount of contamination decreasing, when the extension include angle of both the above-mentioned metal tape was enlarged, it collects in the end of powder and capacity of the section is comparatively made into size. Moreover, powder content becomes high, as a result of the contamination force of the powder by the reduction roll becoming large and the amount of contamination increasing, when the extension include angle of both the metal tape was made small, it collects in the end of powder and capacity of the section is comparatively made into smallness. Thus, powder content is easily controllable by adjusting the extension include angle of both the metal tape suitably, collecting in the end of powder, and adjusting the capacity of the section.

[0015] Moreover, if it becomes the thing of the shape of a hopper with which the section is covered on said wall and metal tape in a part for the side periphery which collects in the end of powder, it collects in the end of powder and the powder of a constant rate is supplied to circles by falling in the end of powder and covering the crosswise both-sides part of a metal tape by the prevention wall, powder will be

supplied to homogeneity over the crosswise whole region of a metal tape, without powder falling.

[0016] Moreover, if the primary article manufactured by the above-mentioned approach is made to insert in between the second two more reduction rolls and the outside of that primary article is made to join a metal tape with this second reduction roll, powdered content will become low at the same time the thickness of an ingredient body increases.

[0017]

[Example] Hereafter, the example of the manufacture approach concerning this invention is explained with reference to a drawing. In drawing 1 and 2, the reduction roll of the Yuji Hidari book which installed 1a and 1b horizontally, 2a, and 2b are the metal tapes which it lets out from the rolls 3a and 3b formed in right-and-left each \*\*, and insert in these metal tape 2a and 2b from the upper part between said two reduction roll 1a and 1b.

[0018] Coordinate reduction rolls 1a and 1b with a non-illustrated driving source, they carry out a rotation drive respectively with predetermined driving force, make both above-mentioned metal tape 2a and 2b join mutually with the predetermined rolling force, and produce the tape-like ingredient body a.

[0019] In addition, although it is not limited to this although you may make it coordinate the rotation drive of reduction rolls 1a and 1b with driving sources, such as a motor, directly, for example, it is not illustrated, it installs two or more adjustment rolls horizontally to each rolls 1a and 1b, and a drive roll is made to coordinate it indirectly through these adjustment roll, and it may enable it to fine-adjust the rolling force. Furthermore, the roll for curvature prevention of a reduction roll is installed, and also modification in within the limits [ \*\*\*\* ] is arbitrary.

[0020] A predetermined include angle is made to extend the junction this side part in each metal tape 2a and 2b with tension rollers 4a and 4b, thereby, between both metal tape 2a and 2b, it collects in the end of powder and the section 5 is formed.

[0021] It collects in the above-mentioned end of powder, and the powder supply means [ \*\*\*\* / a feeder etc. ] 6 is installed above the section 5, it collects with this supply means 6 in the end of powder, and continuation supply of the powder 7 of a constant rate is carried out at the section 5. The powder 7 breathed out from delivery 6a is supplied crosswise [ of metal tape 2a and 2b ] at homogeneity as the aperture width of end delivery 6a in the powder supply means 6 being almost the same as that of each metal tape 2a and the width method of 2b.

[0022] Metal tape 2a and 2b are fabricated from the heterogeneous ingredient suitably

chosen from the metals which fabricate by homogeneous solder material or serve as a raw material of solder material and solder material. As solder material, for example, PbSn system solder, PbAgSn system solder, Pb system solder, Sn system solder, In system solder, Au system solder, etc. are mentioned. Moreover, as a metal used as the raw material of solder material, Pb, Sn, Ag, In, Au, etc. are mentioned, for example. [0023] If the case where metal tape 2a and 2b are fabricated from a heterogeneous ingredient is explained in full detail (a) As [ be / PbSn system solder and the tape of another side / tapes of ., one / for example, /, / Pb system solder ] As [ be / the tape of Pb and another side / the tape of (b)., one / for example, /, / when it is the heterogeneous ingredient suitably chosen from solder material / Sn ] when it is the heterogeneous ingredient suitably chosen from the metals used as the raw material of solder material, the tape of (c)., one [ for example, ], is [ PbSn system solder and the tape of another side ] Sn — the case where it is the heterogeneous ingredient which chose one side [ like ] suitably from the metals which serve as a raw material of solder material in another side out of solder material is mentioned. Thus, it is useful to fabricate metal tape 2a and 2b from a heterogeneous ingredient to be made to what is different in near melting temperature on the other hand the whole surface side in the produced composite material A, and give time difference to junction to each field and connected object.

[0024] In addition, like the above, whether both tape 2a and 2b shall be consisted of homogeneous solder material, each tape 2a, and 2b are made to correspond to the various conditions of the purpose of use and others, and whether it shall consist of a heterogeneous ingredient sorts out them suitably. Similarly, it is arbitrary whether thickness of each metal tape 2a and 2b is made the same or it considers as a different thing.

[0025] Powder 7 is the fine particles which consist of a high-melting metallic material, for example, Cu, nickel, Mo, and W, a ceramic, an alumina, glass, BN, etc. from metal tape 2a which comes to use the above-mentioned solder material, and 2b, and is the particles 7a and 7a. — It is desirable to form metal membranes, such as Au, Ag, Cu, and nickel, in a front face, or to carry out surface treatment by flux, and to improve familiarity by metal tape 2a and 2b.

[0026] If \*\*, it collects on right above [ of a both metal tape 2a and the junction this side part 1a and 1b in 2b, i.e., the reduction rolls of two right and left, ] in the end of powder it is extended at a predetermined include angle according to the manufacture approach of above this examples, and the section 5 is formed, it collects in this end of powder and powder 7 is supplied to the section 5, it will be constant-rate \*\*\*\*\*

between metal tape 2a before that powder 7 joining, and the plane of composition of 2b. Furthermore, this powder 7 is involved in by the gravity perpendicularly applied to this powder 7, and migration of each metal tape 2a by the rotation drive of both the reduction rolls 1a and 1b, and 2b between both metal tape 2a and 2b. The composite material A which contained the powder 7 of a constant rate into the cross-section \*\*\*\* central part of the tape-like ingredient body a at homogeneity is obtained by both metal tape 2a and 2b being rolled out and joined to coincidence (refer to drawing 3 ).

[0027] If this composite material A heats and carries out melting of the optimum dose in the condition of having carried on Substrate B, it can hold the thickness (height) of melting solder uniformly by each particle 7a of powder 7, and 7a--, and can make semiconductor chip C set on this solder fix horizontally on Substrate B (refer to drawing 4 ).

[0028] Moreover, when metal tape 2a and 2b are fabricated from a heterogeneous ingredient, it becomes possible to give time difference to junction to each field and connected object in composite material A. For example, since the melting temperature by the side of a tape 2b side (inferior-surface-of-tongue side in drawing 4 ) becomes low to the tape 2 a-th page side (top-face side in drawing 4 ) in composite material A when tape 2a is set to Pb and tape 2b is set to Sn, a tape 2b side side is first fixed to Substrate B, and Chip C is made to fix after predetermined time progress and a tape 2 a-th page side.

[0029] In addition, in an above-mentioned example, both metal tape 2a and the extension include angle of 2b are made small by making distance between tension roller 4a and 4b into smallness like drawing 2 (a), this collects in the end of powder, and as a result of the contamination force of the powder 7 according the capacity of the section 5 to smallness, then reduction rolls 1a and 1b comparatively becoming large and the amount of contamination increasing, the powder content in composite material A becomes high.

[0030] Moreover, both metal tape 2a and the extension include angle of 2b are enlarged by making distance between tension roller 4a and 4b into size like drawing 2 (b), this collects in the end of powder, and as a result of the contamination force of the powder 7 according the capacity of the section 5 to size, then reduction rolls 1a and 1b comparatively becoming small and the amount of contamination decreasing, the powder content in composite material A becomes low.

[0031] Drawing 5 and 6 collect in the end of powder in the above-mentioned example, and express the case where fell metal tape 2a and the crosswise both-sides part of 2b



in the section 5 in the end of wrap powder, and the walls 8a and 8b for prevention are formed in it. Walls 8a and 8b are formed with the hopper 8 built into the upper part of reduction rolls 1a and 1b. In addition, about the quality of the material of configuration metallurgy group tape 2a other than hopper 8, and 2b etc., since it is the same as that of the above-mentioned explanation, it omits here.

[0032] The transverse-plane abbreviation Y configuration which inserts the margo-inferior section in the slots 1c and 1c established in the peripheral face of reduction rolls 1a and 1b loosely falls, and a hopper 8 comes to connect the prevention walls 8a and 8b by the cross-section abbreviation V-like guide plates 8c and 8d which collect in the end of powder and are located in the section 5 upper part.

[0033] Homogeneity is supplied over metal tape 2a and the crosswise whole region of 2b, without collecting in the end of powder and the powder 7 in the section 5 falling according to this example, by \*(ing), since it collects in the end of powder, the section 5 falls a part for that side periphery and it comes to be covered with the prevention walls 8a and 8b, metal tape 2a, and 2b.

[0034] In addition, it is possible to make small both metal tape 2a and the extension include angle of 2b like drawing 6 (a) also in this example, to collect in the end of powder, to make capacity of the section 5 into smallness comparatively, and to make powder content high and to enlarge both metal tape 2a and the extension include angle of 2b, to collect in the end of powder, to make capacity of the section 5 into size comparatively, and to make powder content low like drawing 6 (b). Although justification of tension rollers 4a and 4b performs accommodation of the above-mentioned extension include angle like the above-mentioned example, it is also possible to set up suitably guide plate 8c in a hopper 8 and the extension include angle between 8d, and to perform them, for example.

[0035] the reduction rolls 1a and 1b in the example shown in drawing 1 and 2 in drawing 7 -- caudad -- the second reduction roll 9a and 9b -- preparing -- rolls 10a and 10b from -- the example to which the outside of the ingredient body a is made to join further the metal tapes 2c and 2d which it lets out is shown. In addition, about the quality of the material of the other configuration metallurgy group tape 2a and 2b etc., since it is the same as that of the above-mentioned explanation, it omits here.

[0036] Like reduction rolls 1a and 1b, coordinate the second reduction roll 9a and 9b with a non-illustrated driving source, it carries out a rotation drive respectively with predetermined driving force, makes the outside of metal tape 2a joined with reduction rolls 1a and 1b, and 2b join the metal tapes 2c and 2d with the predetermined rolling force, and produces the heavy-gage-like ingredient body b.

[0037] It fabricates from the heterogeneous ingredient suitably chosen from the metals which fabricate by homogeneous solder material like metal tape 2c and tape 2d of the above-mentioned [ 2d ] a, and 2b, or serve as a raw material of solder material and solder material. In addition, also in this example, it makes it correspond to the various conditions of the purpose of use and others whether each tape 2a, 2b, and 2c and 2d are fabricated by same quality material, or it fabricates with a heterogeneous ingredient, and it sorts out suitably. Similarly, it is arbitrary whether each metal tape 2a, 2b, and thickness (2c and 2d) are made the same or it considers as a different thing.

[0038] It \*\*, and according to this example, composite-material A' which contained the powder 7 of a constant rate at homogeneity into metal tape 2a joined by reduction rolls 1a and 1b and the cross-section \*\*\*\* central part of the heavy-gage-like ingredient body b on which the outside of 2b is made to come to join the metal tapes 2c and 2d is obtained (refer to drawing 8 ).

[0039] moreover -- being such -- an approach -- depending -- if -- first -- a metal -- a tape -- two -- a -- 2b -- joining -- and -- powder -- seven -- containing -- making -- primary -- elegance -- b -- ' -- fabricating -- after that -- a metal -- a tape -- two -- c -- two -- d -- junction -- \*\*\*\* -- having -- final -- producing -- having -- composite material -- A -- ' -- powder -- content -- metal tape 2c -- it is suitably controllable by 2d. for example, -- drawing 7 -- setting -- a metal -- a tape -- two -- a -- 2b -- two -- c -- two -- d -- thickness -- all -- the same -- setting up -- if -- said -- primary -- elegance -- b -- ' -- it can set -- powder -- content -- one -- % -- it is -- if -- final -- producing -- having -- composite material -- A -- ' -- powder -- content -- It becomes 0.5%.

[0040] If the migration direction of primary article b' is horizontally changed with a roller 11 as the second reduction roll 9a and 9b is not limited to what is installed horizontally as shown in drawing 7 , but it is shown in drawing 9 , installing in the vertical direction is also possible.

[0041] In addition, also in the example shown in drawing 7 and drawing 9 , distance between tension roller 4a and 4b is made proper, metal tape 2a and the extension include angle of 2b are set as arbitration, and if it collects in the end of powder and the capacity of the section 5 is adjusted to a request, the content of the powder 7 in composite-material A' is controllable.

[0042] Moreover, in the example shown in drawing 7 and drawing 9 , it is also possible to fall in the end of powder and to cover metal tape 2a and the crosswise both-sides part of 2b by the walls 8a and 8b for prevention using the above-mentioned hopper 8.

[0043] Moreover, it sets on a drawing and is powder 7,400 for convenience. To say nothing of actual particle diameter being very minute although each particle was expanded and expressed, for the thickness of the composite material with which the thickness of the metal tape supplied was produced 1-3mm when giving an example, particle diameter is 20 micrometers, 50 micrometers, and 100 to 0.2-2mm. It is mum grade.

[0044]

[Effect of the Invention] Homogeneity can make contain between both metal tapes by migration of the gravity perpendicularly applied to this powder in the powder of the constant rate which collects in the end of the powder extended at a predetermined include angle in that junction this-side part while the metal tape of two sheets is perpendicularly transported as the manufacture approach of the composite material concerning this invention was explained above, and making it join mutually, forms the section, collects in the end of that powder, and is supplied to the section, and each metal tape.

[0045] Therefore, compared with the conventional approach of sprinkling direct powder, offer of nothing profit and a more reliable composite material is attained very easily and certainly in uniform content of the powder of a constant rate on the top face of the metal tape transported horizontally with \*\*\*\*\*, a feeder, etc. Moreover, powder content is easily controllable by setting up the extension include angle of both the metal tape suitably, collecting in the end of powder, and adjusting the capacity of the section.

[0046] Furthermore, preventing certainly 0 \*\* of the powder which it falls in the end of powder, the crosswise both-sides part of a metal tape is covered by the prevention wall, and a case collects in the end of powder, and is supplied to the section, uniform content of the powder of a constant rate is attained, useless consumption of an ingredient is prevented, and reduction of a manufacturing cost etc. can be expected.

[0047] Moreover, much effectiveness -- powder content is easily controllable by joining the metal tape of two sheets, and making the primary article which comes to contain powder among both tapes insert in between the second two reduction rolls, and making the outside join a metal tape further -- is done so.

#### DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The perspective view showing an example of operation of the manufacture approach concerning this invention.

[Drawing 2] With the front view of drawing 1 When (a) makes powder content high (b) shows the case where it is made low, respectively.,

[Drawing 3] The perspective view of the composite material obtained by drawing 1 and the approach shown in 2.

[Drawing 4] The sectional view showing the operation of the composite material shown in drawing 3 .

[Drawing 5] The perspective view showing the other examples of operation of the manufacture approach concerning this invention.

[Drawing 6] With the front view of drawing 5 When (a) makes powder content high (b) shows the case where it is made low, respectively.,

[Drawing 7] The front view showing the other examples of operation of the manufacture approach concerning this invention.

[Drawing 8] The sectional view of the composite material obtained by the approach shown in drawing 7 .

[Drawing 9] The front view showing the example of a partial change of the approach shown in drawing 7 .

[Drawing 10] The perspective view showing the conventional approach.

[Description of Notations]

A, A': Composite material a, b: Ingredient body 1a, 1b: Reduction roll

2a, 2b, 2c, 2d: Metal tape 4a, 4b: Tension roller

5: Collect in the end of powder and it is the section. 7: Powder 8: Hopper

8a, 8b: Fall in the end of powder and it is a wall for prevention. 9a, 9b: The second reduction roll

水平方向へ並設するものに限定されず、図9に示す如く、一次品b'の移送方向をローラ11によって水平方向へ変換すれば、上下方向へ並設することも可能である。

【0041】尚、図7、図9に示す実施例においても、テンションローラ4a、4b間の距離を適宜とし金属テープ2a、2bの拡開角度を任意に設定して、粉末溜り部5の容量を所望に調整すれば、複合材料A'における粉末7の含有率を制御することができる。

【0042】また図7、図9に示す実施例において、上述のホッパー8を用いて金属テープ2a、2bの幅方向両側部分を粉末零れ防止用の壁体8a、8bで覆うことも可能である。

【0043】また、図面においては便宜上、粉末7、400の各粒子を拡大して表したが、実際の粒子径は極微小なものであることはいうまでもなく、一例を挙げれば、供給される金属テープの厚さが1～3mm、作製された複合材料の厚さが0.2～2mmに対し、粒子径が20μm、50μm、100μm程度である。

【0044】

【発明の効果】本発明に係る複合材料の製造方法は以上説明したように、二枚の金属テープを垂直方向へ移送して相互に接合せしめると共に、その接合手前箇所に所定角度で拡開する粉末溜り部を形成して、その粉末溜り部に供給する一定量の粉末を、この粉末に垂直方向に係る重力と夫々の金属テープの移送によって、両金属テープ間に均一に含有せしめることができる。

【0045】従って、水平方向へ移送する金属テープの上面に手撒きやフィーダー等で直接粉末を撒布する従来の方法に比べ、一定量の粉末の均一な含有を極めて容易且つ確実にし得、より信頼性の高い複合材料の提供が可能になる。また、両金属テープの拡開角度を適宜に設定して粉末溜り部の容量を調節することで、粉末含有率を容易に制御することができる。

【0046】さらに、金属テープの幅方向両側部分を粉末零れ防止壁体で覆って場合は、粉末溜り部に供給する

粉末の零れを確実に防止しつつ、一定量の粉末の均一な含有が可能になり、材料の無駄な消費を阻止して製造コストの低減等が期待できる。

【0047】また、二枚の金属テープを接合し且つ両テープ間に粉末を含有してなる一次品を、二本の第二圧延ロール間に挿通せしめてその外側にさらに金属テープを接合せしめることで、粉末含有率を容易に制御できる等、多くの効果を奏する。

【図面の簡単な説明】

【図1】本発明に係る製造方法の実施の一例を示す斜視図。

【図2】図1の正面図で、(a)は粉末含有率を高くする場合、(b)は低くする場合を夫々示す。

【図3】図1、2に示す方法で得られた複合材料の斜視図。

【図4】図3に示す複合材料の使用方法を表す断面図。

【図5】本発明に係る製造方法の実施の他例を示す斜視図。

【図6】図5の正面図で、(a)は粉末含有率を高くする場合、(b)は低くする場合を夫々示す。

【図7】本発明に係る製造方法の実施の他例を示す正面図。

【図8】図7に示す方法で得られた複合材料の断面図。

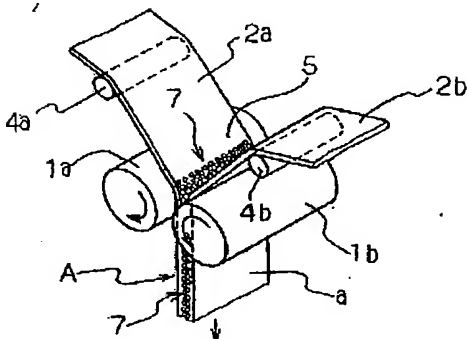
【図9】図7に示す方法の一部変更例を示す正面図。

【図10】従来の方法を示す斜視図。

【符号の説明】

A, A' : 複合材料	a, b : 材料本体	1a,
1b : 圧延ロール		
2a, 2b, 2c, 2d : 金属テープ	4a, 4b : テンションローラ	
5 : 粉末溜り部	7 : 粉末	8 :
		ホッパー
8a, 8b : 粉末零れ防止用の壁体	9a, 9b : 第二圧延ロール	

【図1】 FIG. 1



【図2】 FIG. 2

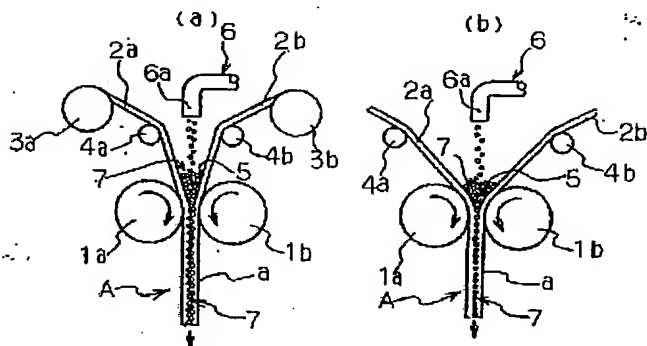


FIG. 3

【図3】

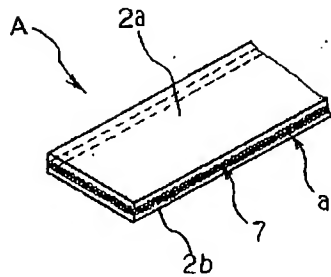


FIG. 4

【図4】

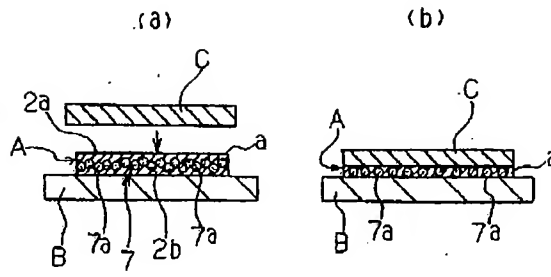


FIG. 8

【図8】

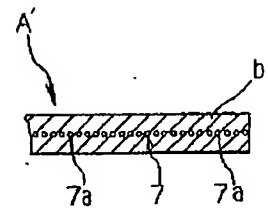


FIG. 5

【図5】

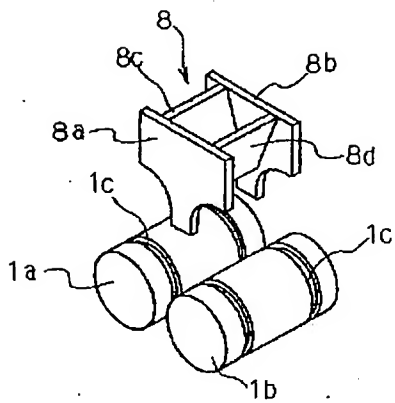


FIG. 6

【図6】

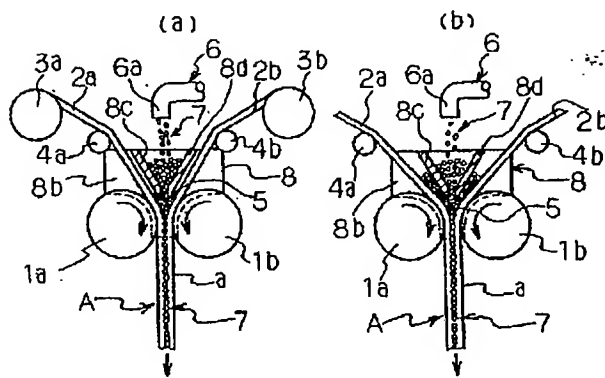


FIG. 7

【図7】

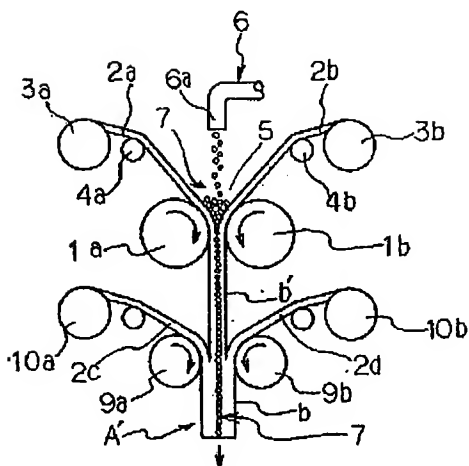


FIG. 9

【図9】

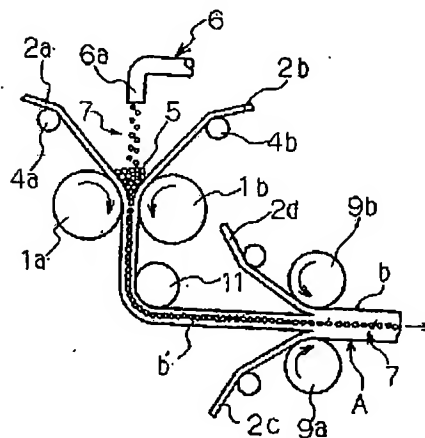


FIG. 10

【図10】

